Evaluation of Ultrasound-Guided Extracorporeal Shock Wave Therapy (ESWT) in the Treatment of Chronic Plantar Fasciitis

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Thirty patients (39 heels) were evaluated to determine the success of ultrasound-guided ESWT for treatment of recalcitrant plantar fasciitis. All patients had been diagnosed and treated for plantar fasciitis for greater than 6 months and had failed at least 3 conservative treatment modalities. Each patient received 3800 shockwaves into the treated heel using the Dornier Epos Ultra ESWT machine. The average postoperative follow-up was 124 days (range, 33 to 255). Written subjective surveys evaluated pre- and posttreatment pain levels using a visual analog scoring system. The mean pretreatment score was 8.51 (range, 5 to 10), which improved to a mean follow-up score of 3.75 (range, 0 to 10). This represents an improvement in the mean VAS of 4.76, which is statistically significant (P = .0002). Twenty-five of 30 patients reported some degree of improvement, with 5 experiencing no change. These early results indicate ultrasound-guided ESWT may be a useful tool in the treatment armamentarium for chronic plantar fasciitis. (The Journal of Foot & Ankle Surgery 44(2):137-143, 2005)

Key words: heel pain, ESWT, shock wave, plantar fasciitis

Heel pain is a common presenting complaint in the foot and ankle practice. Differential diagnoses include plantar fasciitis, heel spur syndrome, calcaneal stress fracture, nerve entrapment and plantar fascial tear among others. The etiology of plantar fasciitis it thought to be biomechanical in nature. The plantar fascia is a dense inelastic fibrous band extending the length of the plantar foot, from the calcaneus to the digits. It is thought to function as a support for the arch, and can become overloaded with biomechanical and anatomic abnormalities such as pes planus, pes cavus, equinus, excessive pronation, and fat-pad atrophy (1). Rather than causing a tear in the midsubstance of the fascia, excessive stress disrupts the attachment to the calcaneus, creating a local inflammatory response. Any healing is constantly disrupted due to repetitive weight bearing stress, generating a chronic cycle of disruption, inflammation and healing. Chronic degenerative changes can be seen on histological examination and are evidenced by a gross thickening of the fascia (1).

Nonoperative therapy has been reported to be effective in nearly 90% of patients over an average 8 to 10 months following the onset of symptoms (2). Various conservative treatment modalities have been employed including strapping, corticosteroid injections, physical therapy, night splints, antiinflammatory medications, stretching exercises, and custom orthotics with varying success (1, 3–11). Despite the amount of literature supporting conservative treatments for plantar fasciitis, there is a subset of patients who continue to suffer with pain.

Recalcitrant cases may be offered elective surgical intervention with open, percutaneous, or endoscopic procedures. Successful results for each of these techniques have been reported (12–15). However, there are potential complications inherent with any open procedure, such as infection, nerve injury, medial arch flattening, lateral column pain, and thrombosis (12–16). Patient and physician dissatisfaction has led to a search for an alternative to the open procedure.

Recently, an alternative modality called extracorporeal shockwave therapy (ESWT) gained the Food and Drug Administration's (FDA) approval for treatment of recalcitrant plantar fasciitis. This technology is based on the successful use of shockwave therapy for the treatment of kidney stones. Shockwaves are considered low energy with energy flux density ranges from 0.05 to 0.10 mJ/mm^2 (17).

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International studies using low-energy ESWT for chronic heel pain reported 57% to 80% good or excellent results (17–19). Studies of high-energy shockwave therapy, as used in the United States, revealed a successful result in 56% to 94% of patients (20–21). Most studies to date have used spark-gap electrohydraulically generated extracorporeal shock waves in the treatment of chronic plantar fasciitis (20–23). Weil et al recently found electro-hydraulic ESWT to be as effective in chronic plantar fasciitis as percutaneous plantar fasciotomy (22). Electromagnetic generation of ESWT coupled with ultrasound visualization is now available, but has not been as thoroughly evaluated. The purpose of this study was to evaluate the short-term effectiveness of electro-magnetically generated, ultrasound guided ESWT in the treatment of recalcitrant plantar fasciitis.

Materials and Methods

This was a prospective study of patients treated over an 8-month period with ESWT for chronic plantar fasciitis. Patients were gathered from 2 private offices and a university clinic. Patients only with the diagnosis of chronic plantar fasciitis were included. Diagnosis of plantar fasciitis was made based on the patient's history of poststatic dyskinesia and physical findings of pain on palpation of plantar medial calcaneal tubercle.

All patients had been diagnosed and treated for plantar fasciitis for greater than 6 months and had failed at least 3 conservative modalities, including nonsteroidal antiinflammatory drugs, cortisone injections, and stretching exercises. Patients with history of corticosteroid injections or previous heel spur/plantar fasciitis surgery were eligible for inclusion. Exclusion criteria included stress or overt calcaneal fracture, tarsal tunnel syndrome, overlying infection or cellulitis, the presence of hardware in the calcaneus, or oncologic involvement of the calcaneus. All patients were offered additional conservative modalities, open surgical intervention, or ESWT. All patients were greater than 18 years of age and legally able to consent to treatment.

Technique

Each heel was subjected to a single ESWT session using the Dornier Epos Ultra (Dornier Medical, Kennesaw, GA) machine (Figs 1 and 2). Each operative extremity was anesthetized using an ankle block of 10 mL of 1% lidocaine plain. Prior to anesthesia, the point of maximal tenderness was palpated and marked with a skin marker. Ultrasound jelly was applied to the patient's heel and the treatment arm of the machine. The treatment arm was aimed at the point of maximal tenderness and the ultrasound screen was used to visualize the plantar fascia and plantar cortex of the calcaneus. A total of 3800 shockwaves or approximately 1300 mJ/mm^2 was delivered to the treatment area. Postoperatively, each patient was advised to discontinue antiinflammatory medications for 1 month and to decrease athletic activity for 3 weeks. Patients

FIGURE 1 Photograph of Dornier Epos Ultra computer screen showing ultrasound visualization of plantar fascial band and guidance of ESWT.

FIGURE 2 Photograph of ESWT in progress. Ultrasound coupling gel is used on the foot as an interface both for the shockwaves and the ultrasound probe.